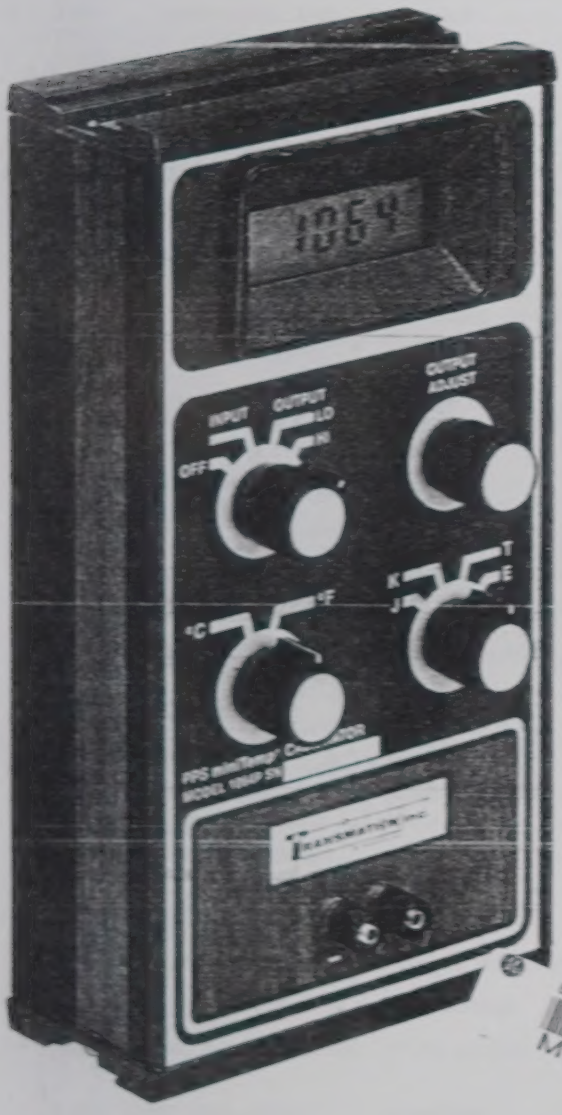
Your 1st Source in Calibration

TRANSMATION inc.
ROCHESTER, NY U.S.A.

INSTRUCTION MANUAL



MODEL 1064P
THERMOCOUPLE CALIBRATO

I.S. NO.: 100787-900

DATE: APRIL, 1986

SUPERSEDES: SEPTEMBER, 1984

FILE: TESTER

Electronic Systems - Los Angeles
MI4444X

INTERFACE INSTRUMENTATION · DIGITAL/ANALOG

Analysis • Specifications • Design • Production

TRANSMATION inc.
877 MT. READ BLVD. □ P.O. BOX 7903 □ ROCHESTER, NEW YORK U.S.A. 14606
TELEX 97-8214 (TRANSMAT ROC) □ TELEPHONE (01) 716-254-8000

TABLE OF CONTENTS

SECTION		PAGE
1.	GENERAL INFORMATION	
1.1	DESCRIPTION	1
1.2	SPECIFICATIONS	1
1.3	UNPACKING	1
1.4	RECOMMENDED SPARE PARTS LIST	1
2.	OPERATION	
2.1	CONTROLS AND INDICATORS	2
2.2	OPERATING INSTRUCTIONS	2
3.	MAINTENANCE	
3.1	BATTERY REPLACEMENT	4
3.2	RECALIBRATION	4
3.3	ROUTINE MAINTENANCE	4
FACTORY SERVICE AND WARRANTY STATEMENT		6

TABLE 1
THERMOCOUPLE WIRE COLOR-CODING TABLE

T/C TYPE	METAL USED		THERMOCOUPLE WIRE COLOR			T/C EXTENSION WIRE COLOR		
	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE	OVERALL	POSITIVE	NEGATIVE	OVERALL
J	IRON	CONSTANTAN	WHITE	RED	BROWN	WHITE	RED	BLACK
K	CHROMEL	ALUMEL	YELLOW	RED	BROWN	YELLOW	RED	YELLOW
T	COPPER	CONSTANTAN	BLUE	RED	BROWN	BLUE	RED	BLUE
E	CHROMEL	CONSTANTAN	PURPLE	RED	BROWN	PURPLE	RED	PURPLE

1. GENERAL INFORMATION

1.1 DESCRIPTION

The Transmation Model 1064P Thermocouple Calibrator is a dual-function, hand-held digital temperature indicator and calibrator designed to simulate and/or measure four thermocouple types: J, K, T and E.

The measured or simulated temperature is indicated directly in °C or °F on the liquid crystal display. Thermocouple type, temperature scale and mode of operation are selected by means of front-panel switches.

The Model 1064P is calibrated directly in °C or °F with a millivolt-to-temperature conformance of 1°. A single pair of input terminals with a built-in thermal sensor serves all input types, eliminating thermocouple materials from within the instrument and making precise factory calibration to established thermocouple tables possible. Input signals are automatically linearized per NBS Monograph 125.

For thermocouple signal simulation, the Model 1064P generates a cold-junction compensated millivolt output that is the equivalent of the indicated temperature.

Power is provided by a 9V alkaline battery. Sealed switches and a gasketed housing insure reliability in harsh industrial environments.

1.2 SPECIFICATIONS

Unless otherwise indicated, all specifications are referred to an ambient temperature of 25°C ± 1°C (77°F ± 2°F).

1.2.1 INPUT:

TYPES	RANGES	
J	-200°C to 1200°C	-350°F to 2190°F
K	-200°C to 1370°C	-350°F to 2500°F
T	-200°C to 400°C	-350°F to 750°F
E	-200°C to 1000°C	-350°F to 1830°F

1.2.2 CALIBRATED ACCURACY: ±1° C or F, ±1 Least Significant Digit

1.2.3 RESOLUTION: ±1° C or F

1.2.4 REPEATABILITY: ±1 Least Significant Digit

1.2.5 INPUT IMPEDANCE: 10 megohms minimum

1.2.6 NORMAL MODE REJECTION: 50 dB minimum @ 50/60 Hz

1.2.7 INPUT BIAS CURRENT: 5 nA maximum

1.2.8 MAXIMUM NORMAL MODE VOLTAGE: 125V RMS

1.2.9 MAXIMUM COMMON MODE VOLTAGE: 500V RMS

1.2.10 OUTPUT: Linearized, cold-junction compensated mV equivalent of input temperature ranges

1.2.11 OUTPUT IMPEDANCE:
T/C Type J, K, T: 80 ohms maximum
T/C Type E: 90 ohms maximum

1.2.12 UPDATE RATE: 3 readings per second

1.2.13 RECOMMENDED AMBIENT TEMPERATURE: 4°C to 50°C (40°F to 122°F)

1.2.14 STORAGE TEMPERATURE: -40°C to 50°C (-40°F to 122°F)

1.2.15 TEMPERATURE EFFECT:
Cold Junction: ±0.025°/degree
Zero Drift: ±1 uV/°C
Reading Error: ±0.01%/°C

1.2.16 WARM-UP TIME TO RATED ACCURACY: 15 seconds maximum

1.2.17 POWER REQUIREMENTS: 9V alkaline transistor battery (NEDA Type 1604)

1.2.18 BATTERY VOLTAGE EFFECT: Negligible until "LOW BAT" indicated on display

1.2.19 BATTERY LIFE: 1 month typical (48 hours continuous operation)

1.2.20 DIMENSIONS (HWD): 21 cm x 11.4 cm x 7 cm (8.25" x 4.5" x 2.75")

1.2.21 WEIGHT: 1.13 kg (2.5 lbs.)

1.3 UNPACKING

It is recommended that all packing materials be retained in the event the instrument must be returned to the factory. The Model 1064P is shipped in its leather carrying case and is equipped with a 9V alkaline battery.

1.4 RECOMMENDED SPARE PARTS LIST

PART NO.	DESCRIPTION
100780-052	Binding Post Assembly
759550-006	Battery, 9V Alkaline (NEDA Type 1604)
100001-018	Function Switch Knob
100001-019	Output Adjust Knob
100740-207	Liquid Crystal Display
759007-034	I/O and Class-of-Service Select Switch
759007-050	Temperature Units Select Switch
759995-010	Carrying Case
100787-900	Instruction Manual

NOTE:

When ordering spare or replacement parts for an instrument, please specify the model and serial number.

2. OPERATION

2.1 CONTROLS AND INDICATORS

All control and adjustment switches, indicators and terminals are located on the front panel, as illustrated in Figure 2-1 below.

2.1.1 CLASS-OF-SERVICE SELECTOR

The four-position Class-of-Service Selector is used to determine the thermocouple type (J, K, T or E) to be simulated and/or measured.

2.1.2 TEMPERATURE UNITS SELECTOR

The two-position (°C and °F) Temperature Units Selector is used to select the temperature units for the simulated and/or measured thermocouple signal.

2.1.3 INPUT/OUTPUT DIAL

The Input/Output Dial selects the mode of operation (i.e. measure or calibrate). There are four settings defined as follows:

- OFF - Disengages the instrument from battery power
- INPUT - Sets up the instrument to measure a thermocouple input signal and read out its value in temperature units
- OUTPUT LO - Provides a mV output that simulates a thermocouple signal within the bottom half of the range selected (see Specification 1.2.1)
- OUTPUT HI - Provides a mV output that simulates a thermocouple signal within the top half of the range selected (see Specification 1.2.1)

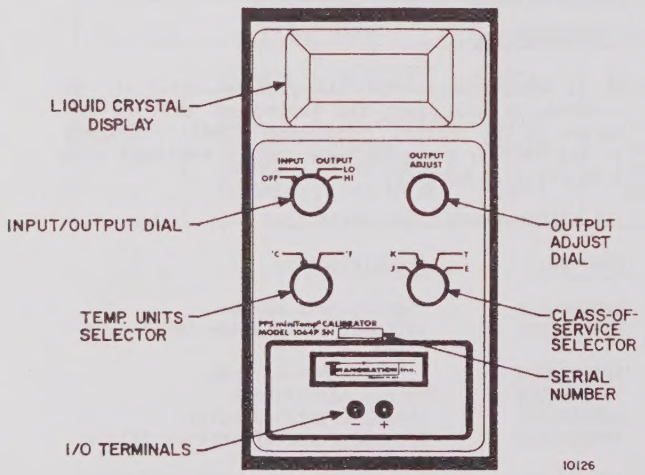


FIGURE 2-1
1064P FRONT PANEL LAYOUT

2.1.4 OUTPUT ADJUST DIAL

The Output Adjust Dial is a 10-turn potentiometer that controls the amplitude of the mV output signal. Once the LO range or HI range is selected on the Input/Output Dial, the Output Adjust Dial enables precise simulation of any temperature within the range of the selected thermocouple type.

2.1.5 LIQUID CRYSTAL DISPLAY

The Liquid Crystal Display provides readouts of measured/simulated signals that are scaled in temperature units. Four decade positions are dedicated to displaying temperature values (1° resolution).

The temperature units indicator (°C or °F) appears at the far right portion of the display. The polarity indicator ("-" for negative values, no sign for positive values) appears in the most significant decade. The characters are 1.02 cm (0.4 inches) high.

When the battery needs to be replaced, a "LOW BAT" message is displayed.

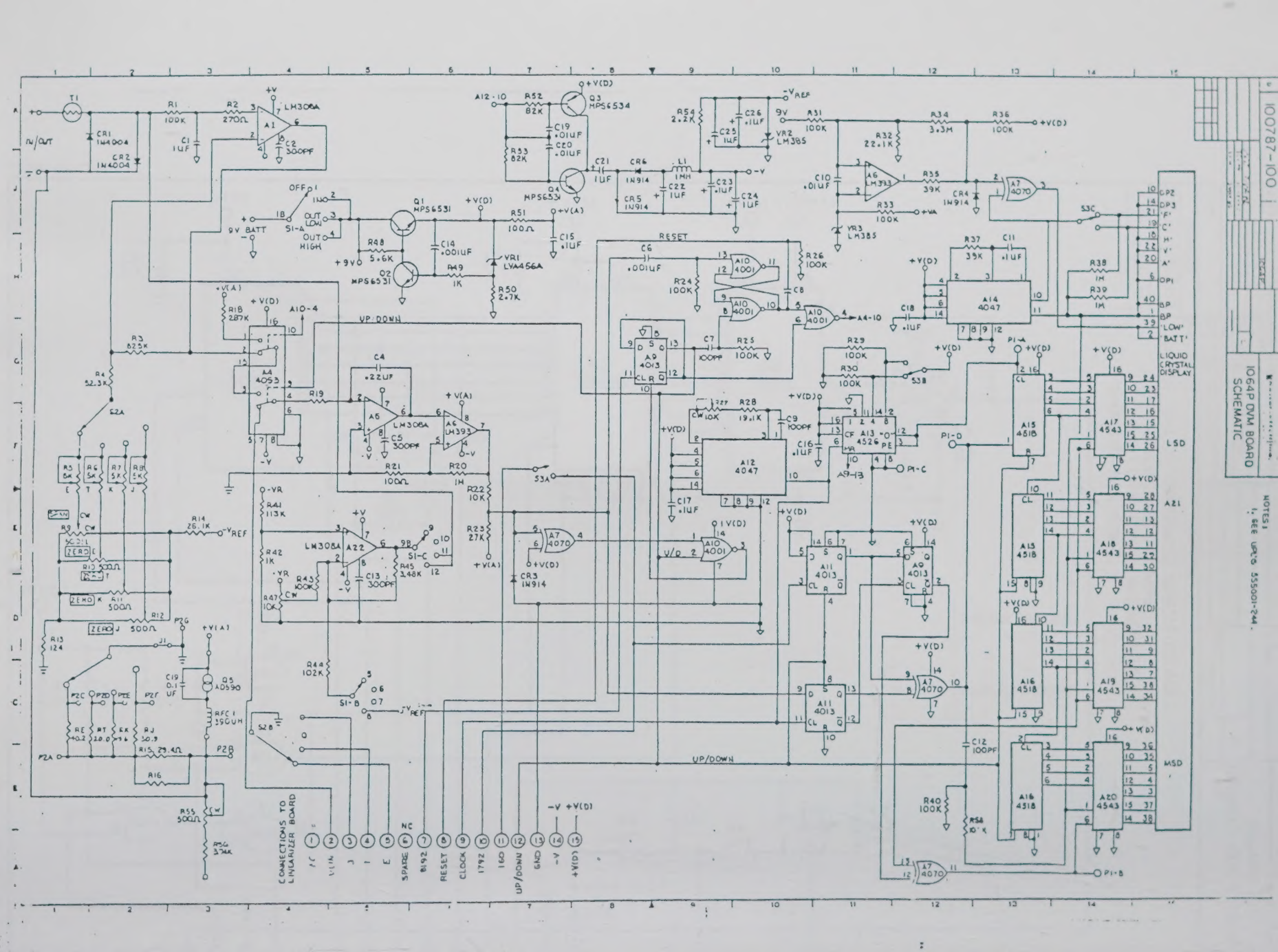
2.1.6 INPUT/OUTPUT TERMINALS

The Model 1064P is equipped with a set of 5-way binding post I/O terminals. A built-in thermal sensor circuit automatically applies a temperature compensating signal to the terminals. Half junctions (i.e. an ice point reference cell or ice bath) are not required for normal operation. Polarity is indicated by a "+" or "-" sign below each post.

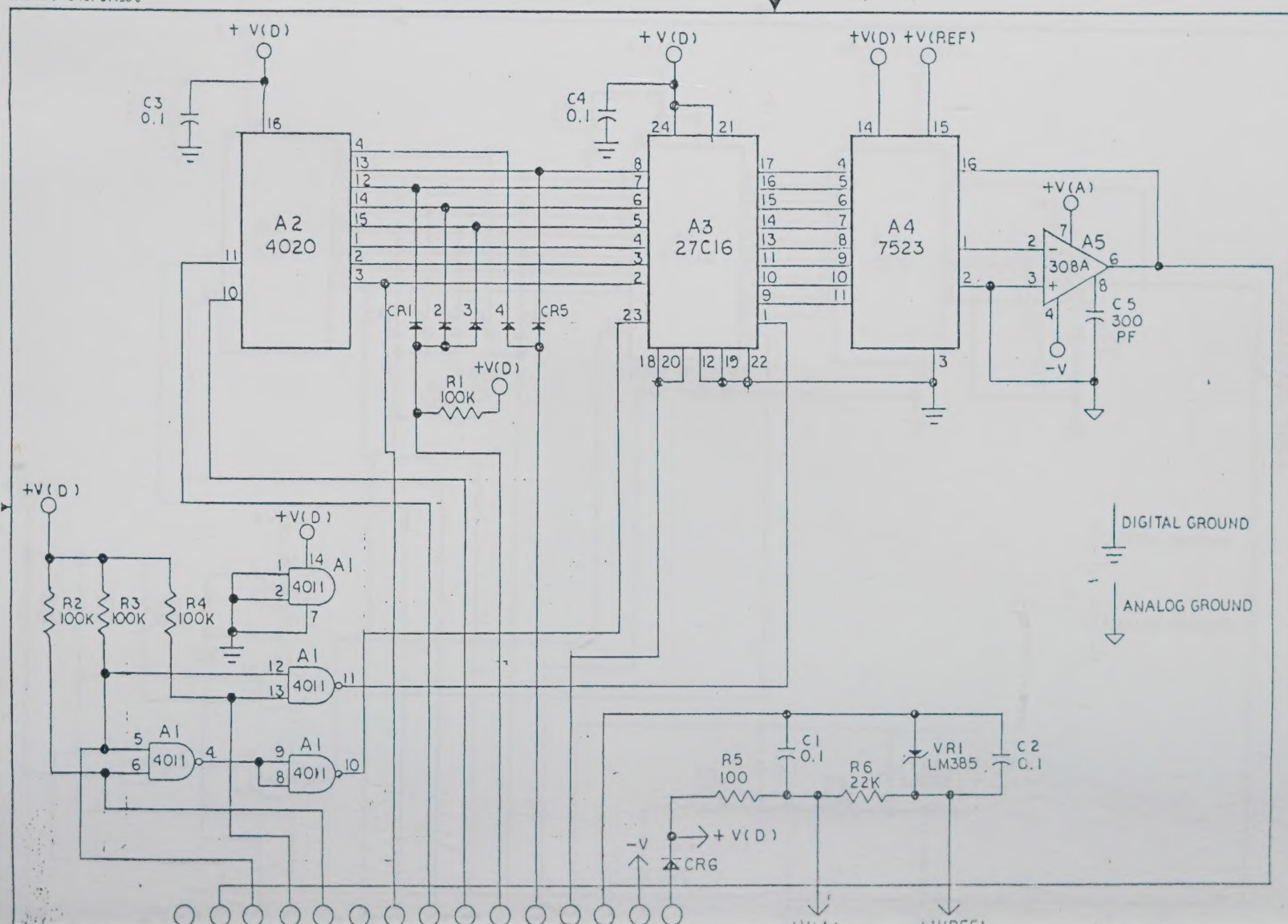
2.2 OPERATING INSTRUCTIONS

Before operating the Model 1064P, consult the following statements:

- Observe thermocouple polarity conventions. The RED thermocouple lead is connected to the NEGATIVE binding post terminal. The COLOR-CODED lead is connected to the POSITIVE terminal. Refer to the Thermocouple Wire Color-Coding Table on the inside front cover.
- When the thermocouple wires or binding posts are handled, it may take several minutes for the thermal gradients introduced by body temperature to stabilize. To minimize the stabilization period, handle the thermocouple wire and binding posts by the insulation only.


1064P DVM BOARD SCHEMATIC
100787-100
NOTES:
1. SEE UPTO 555001-244.
LSD
AZ1
MSD
LIQUID CRYSTAL DISPLAY
CONNECTIONS TO LINEARIZER BOARD
RESET
UP/DOWN
CLOCK
GND
SPARE
NC
-V
+V(D)
+V(A)
-VREF
+VREF

BRUNING 40-107 31430-6



NOTES: UNLESS OTHERWISE SPECIFIED ALL:
1. RESISTORS ARE IN OHMS.
2. CAPACITORS ARE IN MICROFARADS.
3. DIODES ARE IN914.

CHANGES			
REV	APP	BY	ECN
A			
3	11/13/23	ELN	13770

SIZE B | 100787-101 | B

SHEET 1 OF 1

CUST. NO.

F.O. NO.

DR ZAZ 3-23-83

CHK

ENG L.F.W. 25 MAR 83

MATERIAL

FINISH

APPLICATION

NEXT ASSY.

USED ON

SCALE

B

1064P 128
SEGMENT ROM LINEARI

RANDMATION

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_05458

BRUNING 40-107 314306

NOTES: UNLESS OTHERWISE SPECIFIED ALL:
1. RESISTORS ARE IN OHMS.
2. CAPACITORS ARE IN MICROFARADS.
3. DIODES ARE IN914.

REV	APP	BY	ECN
A			
3	Mis/83	ELH	3726

CHANGES

SHEET 1 OF 1	ITEM NO.	
CUST NO.	DR. CAE 3-23-89	
	CHK	
T.O. NO.	ENG APVD 4/MAR 89	

MATERIAL:		FINISH:
DIMENSIONS ARE IN INCHES TOLERANCES ON .X DEC. ±.1 .XX DEC. ANGLES ± .XXX DEC. ±.005	NEXT ASSY.	USED ON
SCALE		

B

10640P 128
SEGMENT ROM LINEAR

MANUMATION
NOT MADE OF U.S.A.

B

IOU/R/-IOI

2.2.1 MEASURING A THERMOCOUPLE SIGNAL

1. Connect the thermocouple leads directly to the I/O terminals. Consult Figure 2-2 below for input connection information. If the leads must be extended, use thermocouple extension wire of the SAME type as the thermocouple being connected.

2. Set the Class-of-Service Selector to the thermocouple type being measured and set the Temperature Units Selector to the temperature units (°C or °F) to be displayed.

3. Set the Input/Output Dial to INPUT.

The measured value will read out on the display after approximately three seconds.

2.2.2 CALIBRATING A THERMOCOUPLE INSTRUMENT

1. At the instrument being calibrated, replace the thermocouple input with the Model 1064P. Connect the I/O terminals of the Model 1064P to the thermocouple instrument's input terminals. Use thermocouple leads that match the thermocouple being replaced. Consult Figure 2-3 for connection information.

2. Set the Class-of-Service Selector to the thermocouple type being replaced and set the Temperature Units Selector to the temperature units (°C or °F) to be displayed.

3. Set the Input/Output Dial to OUTPUT (LO or HI as required).

4. Turn the Output Adjust Dial until the Model 1064P's display indicates the zero value specified for the instrument being calibrated.

5. On the instrument being calibrated, make the proper adjustments to obtain a reading equal to the value displayed on the Model 1064P.

6. To calibrate the span, repeat Steps 3-5 except, for Step 4, substitute the specified span value for the zero value.

NOTE:

For accurate results, the input impedance of the instrument being calibrated must be at least 1000 times greater than the output of the Model 1064P (i.e. 80K ohms > 80 ohms).

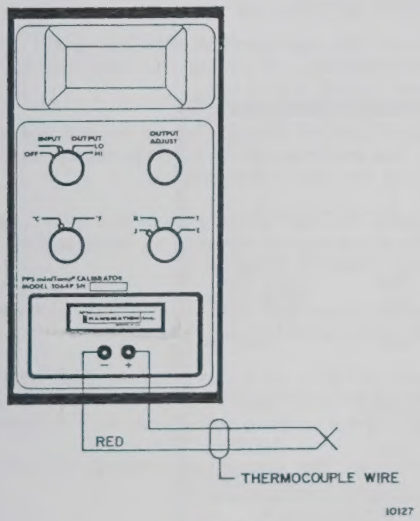


FIGURE 2-2
MEASURING A THERMOCOUPLE SIGNAL

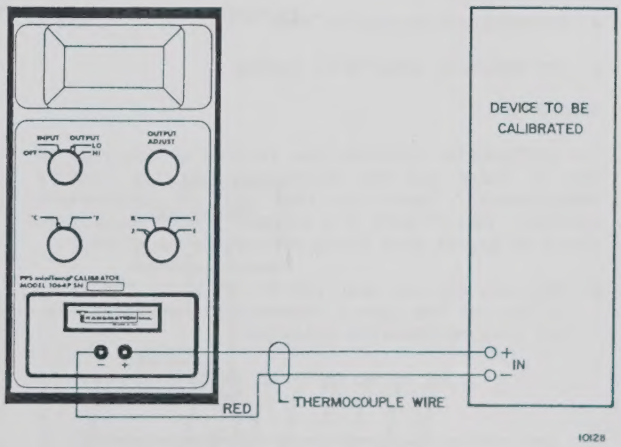


FIGURE 2-3
CALIBRATING A THERMOCOUPLE INSTRUMENT

3.1 BATTERY REPLACEMENT

> CAUTION:
>
> DO NOT change the battery where potentially hazardous atmospheric conditions exist.

1. Remove the screws that secure the bottom cover plate to the instrument housing and lift out the attached battery assembly.
2. Detach the battery from the plate.
3. Insert a new 9V alkaline battery, NEDA Type 1604. Non-alkaline batteries may be substituted; however, battery life will be substantially diminished.
4. Replace the cover plate.

3.2 CALIBRATION

Every Model 1064P is factory calibrated. Do not attempt recalibration unless equipment of sufficient accuracy is available.

EQUIPMENT:

- Ice point reference - Transmation Model 1010, 1013 or equivalent
- Millivolt source - ±70 mV range, ±2 uV accuracy
- Thermocouple extension wire - Type J, K, T and E
- Thermocouple conversion tables

PROCEDURE:

The calibration controls are located on the edge of the PC board and are accessible via the battery compartment. There are four sets of calibration controls (see Figure 3-1 below). Use these controls to adjust each class-of-service position.

- Zero pot R11 and span pot R7 calibrate the circuitry for the type K thermocouple position on the Class-of-Service Selector.
- Zero pot R12 and span pot R8 calibrate the circuitry for the type J thermocouple position on the Class-of-Service Selector.
- Zero pot R9 and span pot R5 calibrate the circuitry for the type E thermocouple position on the Class-of-Service Selector.
- Zero pot R10 and span pot R6 calibrate the circuitry for the type T thermocouple position on the Class-of-Service Selector.

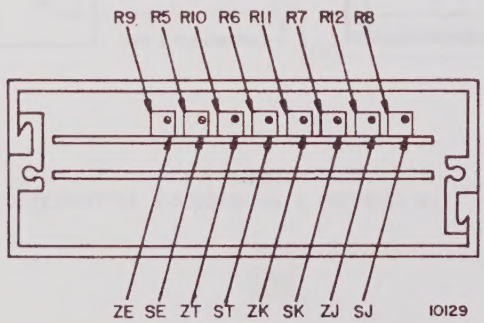


FIGURE 3-1
CALIBRATION CONTROL LOCATION

1. Connect the Model 1064P, the ice point reference and the mV source as illustrated in Figure 3-2a or 3-2b.

> NOTE:
>
> The configuration in Figure 3-2a is recommended for type J, K and T classes-of-service. The configuration shown in Figure 3-2b is recommended for type E class-of-service.

2. Set the Class-of-Service Selector to the position to be calibrated. For maximum accuracy, calibrate the instrument in °F. By calibrating in °F, the instrument will be calibrated in °C as well.
3. Set the Input/Output Dial to INPUT.
4. Adjust the mV source for an output equivalent to the maximum negative temperature value specified for that thermocouple (refer to Specification 1.2.1).
5. Adjust the appropriate zero pot until the correct reading, +0 counts, is obtained on the Model 1064P's display.
6. Adjust the mV source for an output equivalent to the maximum positive temperature value specified for that thermocouple.
7. Adjust the appropriate span pot until the correct reading, +0 counts, is obtained on the Model 1064P's display.
8. Repeat Steps 4-7 until the error is 0 counts for both calibration points.
9. Seal the pots with a substance that will retain the adjustment at its setting. Glyptol or an equivalent binding substance is recommended.

To calibrate the remaining class-of-service positions, repeat Steps 2-9.

3.3 ROUTINE MAINTENANCE

Because of the extremely dense packaging and large number of precision components used in the Model 1064P, it is recommended that field service be limited to battery replacement and periodic inspection for dirty or broken parts. Transmation provides a factory repair service to accommodate customer service requirements. See the Factory Service and Warranty Statement on the back cover.

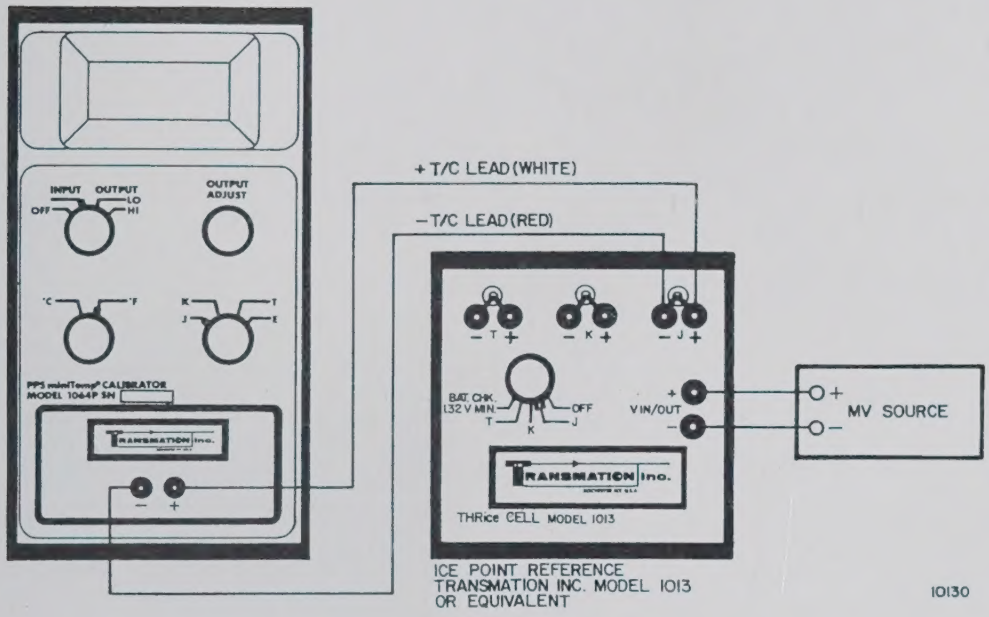


FIGURE 3-2a
CALIBRATION SETUP FOR TYPES J, K AND T THERMOCOUPLES

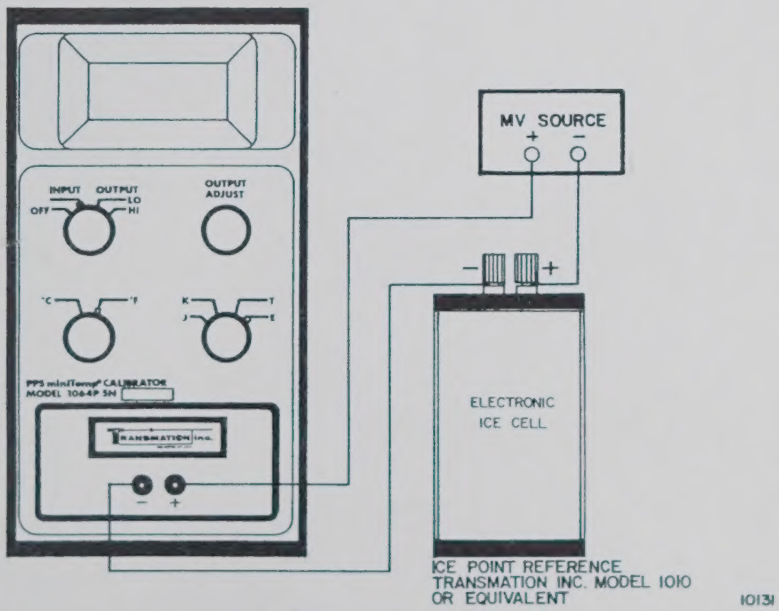


FIGURE 3-2b
CALIBRATION SETUP FOR TYPE E THERMOCOUPLES

FACTORY SERVICE AND WARRANTY STATEMENT

FACTORY SERVICE:

Should service become necessary and field repair is inconvenient or undesirable, the instrument may be returned to the factory for repair or replacement as necessary. Please assist our factory service department by defining the symptoms precisely. Boards and/or instruments should be shipped prepaid via Air Parcel Post (Special Handling), UPS or other shipping means as the urgency of service requires, to:

FACTORY SERVICE DEPARTMENT
TRANSMATION, INC.

Contact your local representative for nearest repair facility.

WARRANTY:

The Company warrants all equipment manufactured by it and bearing its nameplate and all repairs made by the Company to be free from defects in material or workmanship under normal use and service for a period of one year from the date of delivery to the Purchaser. Expendable items such as fuses, batteries, test leads and carrying cases are not warranted. The Company will repair, at its option, without charge, F.O.B. Company's factory, any equipment or part thereof found to be defective in material or workmanship if such item is returned to Company's factory, transportation prepaid.

Limitation of Warranty and Liability. The liability of the Company (except as to title) shall in no case exceed the cost of correcting defects in products and shall not extend beyond one year from date of delivery. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery. The Company assumes no liability for the consequences of misuse of products by the Purchaser.

THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE. Any references by the Company to Purchaser's specifications and similar requirements is only to describe products, and no representations or other terms therein shall have any force or effect. Catalogs, circulars and similar literature of the Company are issued for general information purposes only and shall not be deemed to modify the provisions hereof.

The foregoing is the Company's only obligation and the Purchaser's only remedy for breach of warranty; and except for gross negligence, willful misconduct and remedies permitted under any other clause of these Terms and Conditions, the foregoing is the Purchaser's only remedy hereunder by way of breach of contract, negligence or otherwise. In no event shall the Purchaser be entitled to incidental, special or consequential damages. The Company does not authorize any agent or representative to warrant product fitness for any particular use or to make any other warranty, express or implied, or to assume any other liability, except as set forth herein.

Discrepancies in Shipment and Damage to Merchandise. Products manufactured by the Company are carefully packed and thoroughly inspected before leaving the Company's factory. Any claim for discrepancies will be honored only if reported within 15 days from receipt of shipment.

Responsibility for safe delivery of products is assumed by the carrier upon acceptance of the shipment. Consequently, claims for loss or damage sustained in transit must be filed with the carrier as follows: Written requests for inspection by the carrier's agent should be made within 15 days of the delivery date when concealed loss or damage is discovered. Concealed loss or damage means loss or damage which is not apparent until merchandise is unpacked; contents may be damaged in transit due to rough handling even though packaging may not show external damage. As to visible loss or damage, any external evidence of loss or damage must be noted on the freight bill or express receipt, and such document should be signed by the carrier's agent at the time of delivery. The Purchaser's failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor a damage claim. The carrier will supply a form for filing such a claim.

Miscellaneous. This Agreement shall be construed and interpreted under the laws of the State of New York. The parties hereby consent to the jurisdiction of the courts of the State of New York and agree that venue shall lie in Monroe County. The invalidity in whole or in part of any provision hereof shall not affect the validity of any other provision.

TRANSMATION inc.
977 MT. READ BLVD. P.O. BOX 7803 ROCHESTER, NEW YORK U.S.A. 14606
TELEX 97-8314 (TRANSMAT ROC) TELEPHONE (01) 716-254-9000

MP MASTER
MA34819